CASE STUDY – Molding	
TASK TITLE: Molding	
Task Description:	The Molding task's purpose is to construct a mold. Mold construction requires completion of different assembly and finishing tasks including: building, grinding, cutting and sanding. Further guidance for each assembly and finishing task can be found in the Maintenance and Inspection (M/I) Guide: Case Study 19 - Grinding, Case Study 4 - Cutting, and Case Study 39 - Sanding. Typical environments in which the molding task may be found can include: • Plastic Molding • Fabricating Parts • Repairing Parts
Job Performance Measures Most Often Impacted by Molding :	Measure of work performance can include (but are not necessarily limited to): • Quality of the repairs and inspections • Number of pieces completed
Typical Employee Comments about Molding:	Employees typically experience discomfort in the hands/wrists/arms, shoulder/neck, and head/eyes. The hands/wrists/arms and shoulder/neck are the body areas that most commonly receive a "High" priority rating. The remaining body areas are more likely to receive a "Medium" priority rating, or lower.
Suggested Level II Analysis:	Biomechanical Lifting Analysis, Push/Pull Force Analysis, Dynamic Task Analysis

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	• Object too high 	32. Lower the work piece/work surface • lower the table or object so that the individual is positioned at or just below elbow level when assembling parts or removing parts	✓		low	low	med
		123. Raise the person • provide a platform to raise the person in relation to the object	✓		low to med	low to med	med
		• raise the chair and provide a footrest if the feet are unsupported	✓		low to med	low	med
	• Object too far away	41. Move work piece closer to body • pull the object close to the work surface edge rather than reaching across the surface	✓		low	low	low
		• arrange items on work surface by frequency of use	✓		low	low	low

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	• Item is too heavy	61. Provide a mechanical lift device		✓	high	high	high
		131. Reduce weight of work piece • reduce the weight of the object by moving individual components separately	✓		low	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
	• High forces required to pull down top of molding press or remove plastic from molding machine	128. Reduce force required to install or remove the component					
		• use lubricant where feasible	✓		low	low	med
		• modify design of component mold or subsystem to reduce forces during installation or removal		✓	high	med	med
		• investigate a work procedure to reduce plastic overruns	✓		low	med	high
	• Rolling/sliding resistance of cart or piece of equipment causes high forces	19. Improve wheel condition • repair wheels on carts or equipment	✓		low	low	low
		119. Provide wheels • install appropriate wheels	✓		med	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	• Floor/surface condition causes high forces during a rolling or sliding task	17. Improve floor condition • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height	✓ ✓	 ✓	low med high	med med med	high med med
	• Carry distance is more than three steps	126. Reduce carry distance • arrange storage and work areas to reduce travel distances	✓		low	low	med
		67. Provide a powered cart • provide a cart to transport materials		✓	med to high	low	med
		11. Eliminate unnecessary tasks • eliminate or combine handling tasks • transport items in larger quantities instead of handling them individually	 ✓ ✓		 low low	 med med	 med med
		37. Modify facilities to decrease handling • widen doors to allow materials to be handled on carts		✓	high	med	med

Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	• Speed of lift • Item or plastic is stuck in molding machine	13. Encourage ergonomic work techniques • encourage person to avoid rushing while handling items 128. Reduce force required to install or remove the component • use lubricant where feasible • modify design of component mold or subsystem to reduce forces during installation or removal	✓ ✓	 ✓	low low high	low med med	low med med
4. Head/neck bent or twisted	• Objects positioned flat on work surface or too low 	124. Raise the work piece/work surface • elevate the work piece by raising the table or angling the work piece forward.	✓		med	med	med

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	• Building small plastic molds	20. Incorporate rest pauses		✓	high	high	high
	• Reaching for components located off to one side	41. Move work piece closer to body • place the components directly in front of the individual or next to the individual	✓		low	low	low
		55. Provide a hook type tool to pull items	✓		low	low	low
	• Object too high	32. Lower the work piece/work surface • lower the table or object so that the table is positioned at or just above elbow level when assembling parts or removing parts	✓		low	low	low
		123. Raise the person • provide a platform to raise the person in relation to the object	✓	✓	low to med	low to med	med
		• raise the chair and provide a footrest if the feet are unsupported	✓	✓	low	low	med
		152. Relocate the work • reorient the work to make access easier	✓		low	low	low

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	• Trimming 	11. Eliminate unnecessary tasks • modify mold to minimize trimming and sanding		✓	med to high	high	high
7. Hyper-extension of finger/thumb or repeated single finger activation	• Using cutters with a wide handle span	149. Provide appropriate tools • provide cutters with a desirable handle span which is usually less than 3"(7.6cm)	✓		med	high	med

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	• Item is difficult to grasp • Item has no handles • Item is slippery 	149. Provide appropriate tools • provide appropriate tools with features (e.g., handle contour and diameter, grip material) designed to reduce grip forces		✓	high	high	med
	• High force trimming or sanding	11. Eliminate unnecessary tasks • modify mold to minimize trimming and sanding		✓	med to high	high	high

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	• High force trimming or sanding 	11. Eliminate unnecessary tasks • modify mold to minimize trimming and sanding		✓	med to high	high	high
		149. Provide appropriate tools • provide high quality cutting and trimming tools (including clippers and knives) which minimize forces		✓	low to med	low	low
		35. Maintain tracks, rollers, and movement mechanisms • replace blades often	✓		low	low	low
		66. Provide a power tool • provide powered cutting tools for high force tasks		✓	med	low	low
		• use leverage/mechanical advantage (e.g. mechanical presses) to reduce cutting forces	✓		med	low	high

Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	• Lifting dipping racks with small narrow handles 	88. Provide an appropriate handle diameter • provide a wrap around the handle so that the diameter is no less than 1-1.5" (2.5-3.8cm)	✓		low	med	med
	• Hard edges on tools	9. Eliminate exposure to hard edges • provide tools with rounded handles • wrap or cover hard edges	✓ ✓		med low	low low	low low
11. Hands and fingers exposed to cold temperatures	• Rarely occurs	N/A					

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	• Object is too low	124. Raise the work piece/work surface					
		• place heaviest items between knuckle and shoulder height (25”-50”) (64-127 cm)	✓		low	low	low
		• provide a fixed table to support work piece		✓	med	med	med
		• provide an adjustable table or scissor lift for work piece		✓	high	med	med
	• Object is too far away	38. Move closer to the work location					
		• remove obstructions	✓		low	low	low
		• modify style of sliding guard to promote increased access	✓		high	low	med
		41. Move work piece closer to body	✓		low	low	low
	• Person tends to use the back to lift instead of using the legs to assist in the lift. Check to make sure that there is no contributing factor in the workplace	13. Encourage ergonomic work techniques					
		• provide training on ergonomics principles and lifting techniques	✓		low	low	low
		• encourage person to use leg muscles to lift	✓		low	low	low

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	• Access is restricted to a component that needs to be removed	82. Provide adequate work space • improve access to items stored on shelves	✓		low	med	med
		61. Provide a mechanical lift device • provide mechanical assistance for handling the load		✓	high	med	med
	• Work area layout	130. Reduce the angle a person has to turn to transfer the item • for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less	✓		low	low	low
	• Person tends to twist with the back instead of using the legs and feet to pivot	13. Encourage ergonomic work techniques • provide training on ergonomics principles and lifting techniques	✓		low	low	low
		• encourage person to use legs to pivot when handling a load	✓		low	low	low

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	• Person tends to lift with a jerky motion instead of a smooth motion	13. Encourage ergonomic work techniques • encourage person to use smooth controlled movements while handling items 147. Provide an alternate container • contact vendor and request re-packing object in container with handles or increasing object density	✓	✓	low med	low low	low low
15. Static, awkward back postures	• Object located too low 	124. Raise the work piece/work surface • place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm) • provide a fixed table to support work piece • provide an adjustable table or scissors lift for work piece 38. Move closer to the work location • remove obstructions 41. Move work piece closer to body	✓ ✓ ✓ ✓	 ✓	low low high low low	low med med low low	med med med med low

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	• Poor lower back support	52. Provide a footrail or footrest • encourage the person to sit back in chair	✓		low to med	low	low
		87. Provide an appropriate chair/stool • provide a chair which supports lower back		✓	med to high	low	low
		115. Provide support for lower back • adjust back rest • provide a lumbar support pillow	✓ ✓		low low	low low	low low
16. Lifting forces	• Item is too heavy	61. Provide a mechanical lift device		✓	high	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
17. Pushing or pulling	• Rolling/sliding resistance of cart or piece of equipment causes high forces	19. Improve wheel condition • repair wheels on carts or equipment	✓		low	low	med
		119. Provide wheels • provide wheels with appropriate bearings and tread composition	✓		low	low	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	• Floor/surface condition causes high forces during a rolling or sliding task	17. Improve floor condition • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height	✓ ✓	 ✓	low low high	low low med	med med med
18. Whole body vibration	• Rarely occurs	N/A					

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	• Standing in one position	52. Provide a footrail or footrest	✓		low to med	low	low
		1. Alternate between sitting and standing tasks	✓		low	low	med
20. Standing on hard surfaces or exposure to hard edges on legs, knees, and feet	• Hard edges on seat pan 	9. Eliminate exposure to hard edges • provide a pillow to sit on to avoid exposure to hard edges on seat	✓		low	low	med
	• Prolonged standing on hard floors	86. Provide an appropriate anti-fatigue mat		✓	med	low	low
21. Awkward leg postures	• Work object is too low	124. Raise the work piece/work surface • provide an adjustable table for work piece		✓	high	med	med
		20. Incorporate rest pauses	✓		low	med	med

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Awkward foot postures	• Lack of foot space	132. Remove obstructions	✓		low	low	low
		80. Provide adequate leg clearance	✓		low to high	low	low

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	• Low light level due to location of the component	18. Improve visual access to work • light levels should be 75fc to 100fc for work • provide a portable task light that can be moved around the area or clamped onto a support work surface to improve light levels		✓	med	med	med
24. Intensive visual tasks, staring at work objects for long periods	• Work on small components	60. Provide a magnifying glass • provide a magnifying glass that will magnify the work piece - the magnifier should be height, angle and horizontally adjustable		✓	med	med	med

This page intentionally left blank